

Issue 7  
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The definition of STEM has been debated in various sectors nationally as well as locally. In the next several STEAM newsletters we will be having STEM/STEAM experts from North Dakota present their thoughts on what STEM education is. Our first author is Jamie Wirth. Jamie is the Director of the Great Plains STEM Educational Center at Valley City State University and is an assistant professor in mathematics. Jamie has worked extensively with districts to implement quality STEM education.

## What is STEM Education?

By: Jamie Wirth

It is reasonable to assume that most individuals working in education could quickly and easily identify what the acronym STEM stands for. The birth of this acronym, used to describe the individual disciplines of Science, Technology, Engineering, and Mathematics, is typically credited to the National Science Foundation (NSF), which originally referred to it as SMET. (Apparently this sounded too much like "smut," so they changed it). According to Sanders (2009), it wasn't until Thomas Friedman's 2005 best-selling book, *The World is Flat*, that Americans started to believe the U.S. was quickly being surpassed in STEM fields by China and India, thus creating a flow of funding in the U.S. towards all things STEM.

Today, there exists an overwhelming call for increased proficiency in student achievement in the STEM areas. This is largely driven by future labor demand forecasts in STEM areas. Sadly, contemporary research suggests that students in the U.S. are graduating from high school with both low interest and low achievement in these areas.

Of course, there are many efforts at the federal, state, and local levels aimed at reversing these trends. For example, President Obama's 2015 budget included several investments designed to improve teaching and learning in STEM subjects. One of the initiatives, the STEM Teacher Pathways, called for the recruitment, preparation, and retention of 100,000 new effective STEM teachers (U.S. Department of Education, n.d.).

But, what is a STEM teacher? Traditionally, this would refer to any teacher who teaches in one of the four individual disciplines. However, many STEM education professionals, including the staff here at the Great Plains STEM Education Center (GPSEC) at Valley City State University (VCSU), subscribe to a different definition of STEM education. Instead of using the *acronym* definition as merely a quick way of identifying four independent disciplines, we believe in the integrative *methodology* definition of STEM education.



## What is STEM Education? (continued)

A comprehensive definition is as follows:

*Integrative STEM education refers to technological/engineering design-based learning approaches that intentionally integrate the concepts and practices of science and/or mathematics education with the concepts and practices of technology and/or engineering education. Integrative STEM education may be enhanced through further integration with other school subjects, such as language arts, social studies, art, etc. (Sanders & Wells, 2006, as cited in Sanders, 2012, p. 2).*

While contemporary research in STEM education tends to support this definition, the *acronym* definition remains well engrained, constantly contributing to the confusion and ambiguity surrounding STEM education. In fact, colleagues at my own campus mistakenly assume that I am in charge of the individual Science, Technology, Engineering, and Math departments at VCSU because my title indicates that I am the Director of our STEM Education Center. Of course, each of these departments has its own chairperson and dedicated faculty (who don't report to me).

Consider, for example, a scenario where the U.S. was able to successfully produce 100,000 new effective STEM teachers as President Obama called for. Assuming that these new STEM teachers would continue to teach their individual disciplines in complete isolation from one another (as has been the case for more than a century (Sanders, n.d.)), this would only perpetuate the current situation. Furthermore, considering the extensive coursework, licensing requirements, and training experiences required to become an effective teacher in ONE of the four disciplines, it would be unrealistic to expect an individual teacher to somehow become proficient in teaching all FOUR disciplines. Therefore, operating under the *acronym* definition of STEM does not provide the necessary frame of mind for true advancement in STEM education.

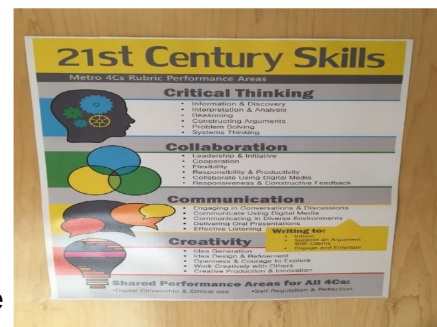
Finally, when educators subscribe to the *acronym* definition, those who teach in disciplines other than the four included areas often feel left out. Presumably, this is why STEM is now transitioning into STEAM (i.e. to include the arts) in many education circles. Once again, we would argue that this is unnecessary, as long as we subscribe to the *methodology* definition. Otherwise, we might as well find a way to fit every letter of every individual discipline into the acronym, in which case we could stop with the acronym and call it "school." The problem, of course, with simply calling it "school" is that education funding initiatives typically focus on the *acronym* definition, thus preserving its existence.

Note that integrative STEM education is NOT meant to supplant S, T, E, and M instruction that may be more effectively taught in non-integrative ways (Sanders, n.d.). For example, I recently spent four days participating in a professional development (PD) workshop designed for middle school math teachers through the National Math + Science Initiative (NMSI). I found the training to be very beneficial. The classroom lessons contained strong incremental, conceptual development of mathematical concepts provided through a student-led discovery learning approach. As a preparer of secondary math teachers at the college level, I gathered many useful ideas and materials that I will share with my students. However, it is important that this type of PD is NOT packaged and sold as STEM education. If it is, we are only perpetuating the traditional silo approach suggested by the *acronym* definition.

## What is STEM Education? (continued)

While attending the NMSI workshop at Fargo Davies High School, I saw a poster (see photo) hanging in each classroom indicating that this school was focused on its students developing 21st Century skills, namely the four Cs (critical thinking, collaboration, communication, and creativity). I was informed that these posters could be found throughout all Fargo Public Schools buildings. The development of these skills has long been considered a hallmark of STEM education. So, how do we teach our students these skills? We improve STEM education. How do we do this?

It is our belief that the first step is to abandon the *acronym* definition and educate stakeholders on the *methodology* definition. New innovations in our world today tend to occur not within one individual discipline, but at the boundaries of the four STEM disciplines (Kaufman, 2003). Therefore, it is important that we don't continue to teach them solely within their individual silos. Lantz (2009) argued that STEM education needs to be seen as trans-disciplinary in that "it offers a multi-faceted whole with greater complexities and new spheres of understanding that ensure the integration of disciplines" (p. 1).



At the GPSEC, our goal is to bring North Dakota to the forefront of STEM education. Our role is to provide leadership, professional development for teachers and administrators, documentation of STEM education competence through endorsements that appear on licenses, promote student competitions, and connect with the larger community. The following snippet, which summarizes our beliefs about STEM education, can be found on the GPSEC website at [www.stem.vcsu.edu](http://www.stem.vcsu.edu).

- ♦ above all, is about student engagement.
- ♦ is about project based learning.
- ♦ utilizes the scientific inquiry process and the engineering design process.
- ♦ is multi-disciplinary.
- ♦ utilizes elements of competition.
- ♦ is about active learning.
- ♦ is about collaboration and teamwork.
- ♦ is about practical problem solving.
- ♦ connects the abstract to the lives of students.
- ♦ intermingles process and content.
- ♦ is standards based.
- ♦ provides students a reason to invest in rigorous subjects.
- ♦ is Education for the 21st century.
- ♦ is about America's future.

So, what is STEM education? STEM is much more than the acronym implies. STEM education...

### References

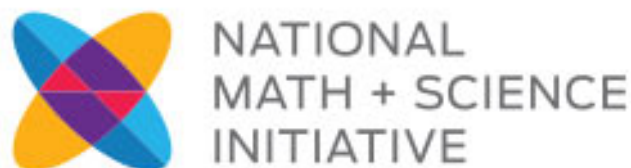
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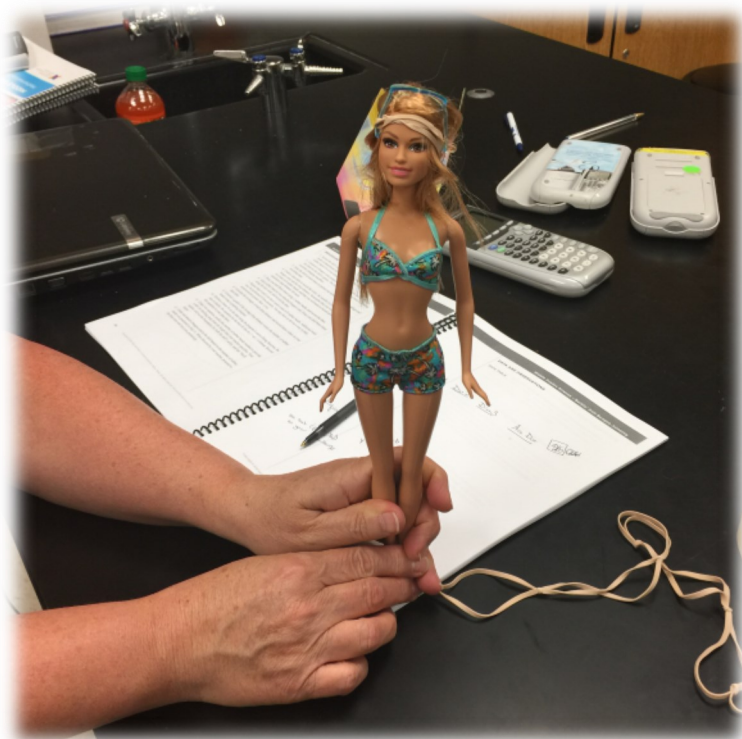
## National Mathematics + Science Training: Laying the Foundation Begins in North Dakota

This summer approximately 170 educators took part in the first Laying the Foundation (LTF) professional development. Two locations were offered to educators; Davies High School in Fargo, July 14-17, 2015, and Century High School in Bismarck, July 28-31, 2015. LTF is one of the programs offered through the National Mathematics + Science Initiative (NMSI). It is a three-year professional development experience continually building and assisting North Dakota educators on content-based, pedagogy-driven, teacher-to-teacher training for grades 3-12. Educators were assisted with teaching strategies and content knowledge that increase rigor in the classroom. Eight strands were offered between the two sites:

- Elementary Mathematics/Science
- Elementary ELA/Social Studies
- Middle School ELA
- High School ELA
- Middle School Science
- Biology
- Middle School Mathematics
- High School Mathematics



Numerous hands-on strategies were provided to educators to take back into the classrooms. One of the activities was *Barbie Bungee Jumping*. Using a number of mathematics and scientific equations, educators determined the proper length of the 'bungee cord' (rubber bands) which would provide Barbie with an exciting but safe jump. Out of the 13 Barbie's that made the jump, only one received injuries.



Participants also received access to NMSI resources which included lesson plans, an online forum for educators to connect and discuss the strategies taught during the professional development, as well as other resources.

## National Mathematics + Science Training: Laying the Foundation Begins in North Dakota (continued)

NMSI is a national initiative aimed at improving how STEM subjects are taught, fostering student interest in mathematics and science and building a college-ready culture. This is done through three programs offered by NMSI 1) Laying the Foundation, 2) AP College Readiness, and 3) U Teach. Superintendent Baesler is committed to bring both LTF and the AP College Readiness to North Dakota Instructors.

Next year, the North Dakota Department of Public Instruction (NDDPI) will be holding year two of LTF for the first cohort of educators as well as a new LTF cohort. AP College Readiness will also be implemented in North Dakota. The AP College Readiness program is a comprehensive approach to increase teacher effectiveness and student achievement in AP courses. You can find more information on NMSI at [www.nmsi.org/](http://www.nmsi.org/)



What North Dakota educators had to say:

*"First useful course I have taken since I have started teaching."*

*"It was amazing. I'm so glad I got to be a part of it!"*

*"Amazing! Thank you so much for giving me back my enthusiasm for teaching!"*

*"This was one of the best trainings I have ever been through. I am glad I was able to attend this training. Thank you so much for coming here!"*

*"Great integration into the standards we already teach."*

## Lincoln Lighting Library: An Intellectual Gymnasium

By: Barbara Sandstrom, Library Media Specialist Lincoln Elementary

### Part 1: An Interactive Space

In the spring of 2014, I had a conversation with my sister about her visit to the Phoenix Children's Museum with her three-year-old daughter. As she described the various interactive spaces my niece explored, it ignited my curiosity about how I could take such a concept and integrate it into the school library setting to make the traditional library more interactive.

After researching the topics of children museums, S.T.E.A.M., and Multiple Intelligences and Maker Spaces, the Lincoln Spark Labs concept started to take shape.



Construction Lab  
Tinkering Lab

### Part 2: Launching of the Spark Labs

The Spark Labs were designed to “spark” student interest, investigation, and experimentation by posing challenges that would cause them to research, create, design and construct. Here are the Spark Labs that were introduced to students:

- **The Digital Lab Challenge:** to become “technology experts” who can teach others how to use technology.
- **The Construction Lab Challenge:** to build the tallest free-standing structure possible by using playing cards.
- **The Tinkering Lab Challenge:** to create a unique and functional “Rube Goldberg” design that sets off a series of chain reaction events when triggered in multiple ways.
- **The Genius Lab Challenge:** for students to develop their own challenge or driving question based on their interests.



## Lincoln Lighting Library: An Intellectual Gymnasium (continued)

Throughout the year, students learned that meeting a challenge takes patience, initiative, and lots of trials and errors! Discussions were held where students shared successes as well as how their ideas became derailed. Through the discussions, students learned new vocabulary, careers, tools to capture their work (taking pictures and videos, making blueprints to document areas that worked or didn't), and formed new hypotheses.

The year ended with a Spark Lab Expo where students showcased their Genius Lab work.

### Part 3: Lincoln Library's Intellectual Gymnasium is Born

The American Association of School Librarians document, *The LMS in Today's Elementary School: Implementing the Common Core State Standards*, provided the stepping stones on how an intellectual gymnasium could be born, developed, and cultivated. The document consisted of 10 initiatives with a multitude of ideas on how to carry out each of them. I selected the following two initiatives to begin this transition:

- ♦ To work on collaboration, communication, creativity, and critical thinking by fostering creativity, innovation, play, building, and experimentation where the librarian...
  - ⇒ Creates Spark Labs for learners of all ages to experiment, construct, design, play, invent, and interact with inventors and entrepreneurs.
  - ⇒ Ensures the library is the center of new technologies that stimulates inventing and creativity.
  - ⇒ Builds a program of self-directed learning.
- ♦ To manage the integration of classroom, library learning, and technology tools where the librarian...
  - ⇒ Uses the school library as the place to experiment with new ideas, best practices and technologies.



## ND Council on the Arts Teacher Incentive Grant Supports Project-Based STEAM Projects

By: Rebecca Engleman, North Dakota Council on Arts, Arts in Education Director

The North Dakota Council on the Arts (NDCA) supports the NDDPI in its efforts to prepare students for the 21<sup>st</sup> century workplace by providing Teacher Incentive Grant funds to teachers who wish to explore new and creative ways of integrating the arts into STEM or other areas of the curriculum. Projects are **teacher driven** and may involve various arts forms, including: visual arts, literary arts, performing arts (drama, music, dance), architecture, design, folk arts, media arts, or any combination of artistic disciplines. Applications for the Teacher Incentive Grant are accepted on an on-going basis beginning September 1, 2015 through April 1, 2016. Maximum request is \$600 with no match required.

### Eligible Activities:

- Supplies that are directly related to the proposed project/activity.
- 50% of the total amount requested may be used to fund artists' or consultants' fees. (*Applications must describe how the consultant or artist will support the learning goals of the project.*)
- Collaborations or team projects that involve several teachers. Teachers may team teach projects and combine funds but must adhere to the following requirements:
  - ◊ Each teacher participating in the team project must submit an individual application that describes specifically how the project will be integrated within the curriculum of their classroom.
  - ◊ Team projects that include the services of the same arts consultant or artist may not exceed six (6) applications per school.
- Costs for art related field trips.

Visit the NDCA website at [www.nd.gov/arts/grants/arts-in-education/teacher-incentive](http://www.nd.gov/arts/grants/arts-in-education/teacher-incentive) for detailed information concerning the Teacher Incentive Grant. If you have any questions or need assistance designing your project, contact Rebecca Engelman at [rengelman@nd.gov](mailto:rengelman@nd.gov).

### Project Exemplars:

**Cathedral School, Bismarck, ND** – Science teacher Kay Power, music teacher Nicole Cook, and visual art specialist Andrea Vinje developed a project that investigated the science of energy and sound through technology, music, and art. Dr. David DeMuth, Director of Integrative STEM Projects, VCSU provided expertise and assistance to teachers and students as they explored the possibilities of creating music with the Makey-Makey through SCRATCH programming. <https://youtu.be/oaSZ147Vvaw>.





## ND Council on the Arts Teacher Incentive Grant Supports Project-Based STEAM Projects (continued)

Victor E. Solheim Elementary, Bismarck, ND, Media Specialist Misti Werle and classroom instructor Casie Gates utilized the Teacher Incentive Grant to explore “community” through technology and photography. Key components of this project included a demonstration for students on basic photography and digital editing by photographer Andrea Freidt and research conducted by students utilizing the North Dakota State Historical Society online photo archive at <https://animoto.com/play/z0hABY10D3JwEPFvrBBVfw>.



Jamestown Elementary Schools, Jamestown, ND, 5<sup>th</sup> grade teachers and teaching artist Bonnie Tressler, inspired by the art work of Dale Chihuly, developed a unit of study that explored states of matter through a collaborative, hands-on, art making process. This project included a glass-blowing demonstration by North Dakota artist Jon Offutt and tour of glass art featured at the Jamestown Arts Center at [https://youtu.be/v9kh\\_Q4avq8](https://youtu.be/v9kh_Q4avq8).



## News from the MSP Sites

### Reflection from a DSU MSP Participant who took the DSU MSP Two-Week Summer Institute

#### **“Common Core Math & Digital Technology” at Dickinson State University**

I want to thank you for your role in providing this opportunity for the teachers in this area. I have taken MSP classes through DSU (Shawna Egli and Janice Noll) for the past two years and have benefitted from all three courses. I was first attracted to the courses as they addressed the Common Core Mathematical Standards; it was also a big benefit that they were local and provided a stipend that would cover the cost of the credits. I have continued to take them due to the structure of the class. The “we will learn this together” culture that Janice and Shawna create in their classes puts no limits on what teachers will learn and allows teachers to get their individual needs met. This “we will learn this together” quite often extends beyond the timeframe of the class itself, ensuring continued support and learning.



In this course, Janice synthesized the current brain research on cultivating a “growth mindset” in our students rather than a “fixed mindset”. Students with a “fixed mindset” believe that they are born with a certain ability and do not believe they can get smarter. In contrast, students with a “growth mindset” believe that



they can learn anything through hard work. She also connected the characteristics of a “growth mindset” to the CC Mathematical Practices by redirecting student phrases such as “I’m not as smart as her” to “I am going to figure out what she does and try it”. I look forward to additional study in how to foster a “growth mindset” in my students.

Shawna provided the creative side of the instruction. She provided with “out of the box” ideas to get students motivated to use the mathematical practices in their problem solving.

Now this may sound unbelievable, but I also found the pre- and post-tests to be well written and informative. They are good examples of the questioning we should be using in our classrooms. They also provided me with insight to how concepts are developed in the grades below me which will allow me to design my instruction from that previous knowledge. I regret that I did not request a copy to aide me in writing my own assessments.

In addition, I cannot emphasize enough the importance of getting quality tools in the hands of teachers. Educators must make use of the personal electronic devices that students already have, to enhance learning in the classroom. The uses of these personal devices can be modeled and managed through a single iPad in the classroom. Most schools are several years away from being one-to-one. After receiving the iPad as part of the class, the teachers will be more committed to making good use of them in their classes.



## News from the MSP Sites (continued)

### Mayville State University Hosts Educational Engineering Institute

We have all heard of civil engineers, mechanical engineers, and even geological engineers, but this summer, Mayville State University (MSU) STEM Education worked with teachers to help them become *educational engineers*. In June, 20 North Dakota K-12 teachers participated in the Educational Engineering Institute (EEI) on the MSU campus as part of a professional learning program funded through the Mathematics and Science Partnerships (MSP). This was the fifth summer of the EEI, in a continued effort to increase student achievement in math and science through teacher professional development. This summer started out with a visit from Dr. Kristi Jean, a chemical engineer from NDSCS. She introduced a variety of engineering-related topics, using enthusiasm and engaging activities to hook EEI participants.



Next, Dr. Joel Ness, a mechanical engineer from UND, led the teachers through problem-solving the engineering way and reverse engineering. The remaining three days at the institute were spent working with Molly Bestge, Gretchen Peterson, and Gretchen Stafslie, STEM educators with West Fargo Public Schools. During this time, the STEM educators led activities and discussions on ways engineering concepts can be applied at the K-12 setting, as well as how to tie them to state content standards. The EEI's culminating event was the creation of a STEM Project-Based Learning (PBL) unit. Teachers, or rather, educational engineers, worked alongside similar grade/content teachers, with help from the STEM educators, to develop and plan a PBL that incorporates engineering concepts

and STEM strategies for use in their classroom. MSU plans to make the PBLs available to teachers across the state. Both of the pictures included show participating teachers involved in activities with our STEM educators. In EEI 1, the teachers are doing an activity that teaches students about coding. In EEI 2, participants are designing and building scaled models of a water treatment facility.



## News from the MSP Sites (continued)

### University of North Dakota

#### Standing Rock Elementary School/Fort Yates - 5<sup>th</sup> Grade Teachers: Amy Ibach and Jocelyn Horob

The fifth grade students designing solar houses? Yes! This past March students started learning about energy. They researched different forms of energy with the main focus being solar energy. Students did experiments using solar panels and light bulbs during various times of day and in different lighting, sun, shade, and fluorescent lights. Students recorded their observations in their science notebooks. The teachers used this as an informal assessment of student work.



The students then moved into planning and designing a house based on the properties of what would capture the best solar energy. The students began

building their houses out of cardboard, tape, wire, solar panels, and light bulbs. They worked in small groups using the designs they created in their journal. Students tested and revised their design based on the amount of solar energy that was being generated. After the process was completed each group presented their findings to the rest of the class.



As teachers, we found this V-STEM experience valuable because students were engaged and were thinking critically. The students found it very beneficial because they learned about different types of energy, how solar energy works, how to design a solar house, and how to revise and rebuild as “engineers.”

#### Valley Middle School/Grand Forks – 6<sup>th</sup> Grade Teachers: Shana Lindeman, Dave Vonesh, Steve Johnson, Lisa Vojacek, and Samantha Schnoor

The sixth graders at Valley Middle School loved taking part in the V-STEM project during the 2014-15 school year. Students created scaled blueprints, determined which materials would best suite a specific climate region, and constructed an efficient solar house. The solar panels

powered lights throughout the house, but students also demonstrated an understanding of power, efficiency, and how these two concepts work together. Students were very engaged in both the math and science of this project. Through their visualizations, they were able to make real-world connections as they worked cooperatively to construct their homes.



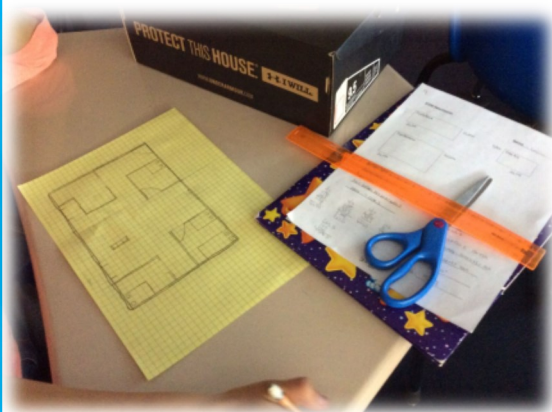
## New from the MSP Sites (continued)

### Turtle Mountain Middle School/Belcourt 8<sup>th</sup> grade

Math Teachers: Kathy Desjarlais and April Nelson; Science Teacher: Danielle Poitra

In late November during V-STEM time, we constructed solar homes in math class. With this project we discussed area, surface area, line and angle relationships. The cardboard homes were constructed in teams of 2-3 students. Upon completion of construction, they were sent to science to add solar panels.

Science topics that were discussed while students were placing panels on their solar homes centered around forms of energy, alternative energy, and light energy. Unfortunately, due to the time of the year, the solar panels did not work well for early morning classes.

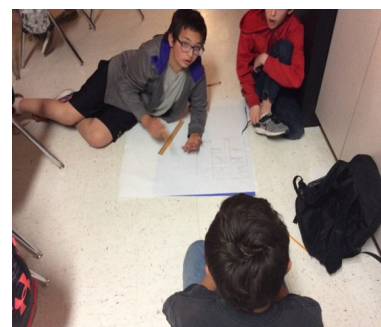


In May we constructed a solar apartment. We had wanted to have our apartment be a high-rise unit with a solar farm attached. However, due to wiring problems (possibly gauge of wire?) all



apartments had stand-alone solar panels. Math class built heavily upon scale, area (again) and engineering design, heating and cooling concerns based upon location with a high-rise apartment. The students absolutely loved the blueprint design. Each student was allowed to design their own blueprint based upon luck of the draw (probability was discussed here) deciding the number of occupants within their apartment. The apartments were constructed from shoeboxes. Science class placed solar panels and took them out to soak up solar rays. The science topics previously discussed were reviewed with this project.

The 7<sup>th</sup> grade students at Turtle Mountain Middle School created floor plans during their V-STEM time. Students worked in groups of two and computed the square footage of their dream solar house. Students discussed and calculated the cost by researching the cost for supplies. This project was a highly motivating experience for students as they applied their math skills to their floor plans.



## RDO Equipment Co.'s Access Your Future Program



### About RDO Equipment Co.

Founded in 1968, RDO Equipment Co. (RDO) sells and supports agriculture, construction, environmental, positioning, surveying, and irrigation equipment from manufacturers including John Deere, Vermeer, and Topcon. With more than 75 locations across the United States, including partnerships in Russia, Ukraine, and Australia, RDO is a total solutions provider. Learn more at [www.rdoequipment.com](http://www.rdoequipment.com).

RDO is a large, dynamic company with incredible resources and opportunities. While we deal in iron, we consider ourselves a service organization. Back in the early 90's, RDO began partnering with colleges and schools to hire talented students. These relationships and the success of hiring skilled graduates became the foundation of the organization's **Access Your Future** (AYF) program. Since the program's inception, nearly 450 students have been sponsored by RDO.

The **Access Your Future** program currently consists of three separate focuses: service, for students interested in a career in diesel technology; sales, for students pursuing degrees related to our industry and/or sales; and parts, for students pursuing a career supporting customers in the parts department.

In recent years, the organization has recognized that individuals are making career choices earlier than college-age. Therefore, the company has put greater emphasis on creating and growing partnerships with high schools and educating students focused not only on the opportunities at RDO, but also the possibilities of a diesel technology education.

"Our success stems from our strong and valued partnerships with both colleges and high schools. We're able to act as a resource to help support the schools, which in turn helps support the students," commented Ryan Johnson, Employee Relations Director.

Just ask Alex, a service technician working in the Red River Valley. He joined RDO in 2009 as a sponsored AYF student while going to school at North Dakota State College of Science (NDSCS) in Wahpeton, ND. Alex knew early on that he wanted to work with equipment. "I have always been a 'gearhead.' In high school I took all the shop classes I could and even served as a teacher's aide. But helping my uncle on his farm is what really started my interest in diesel technology," says Alex.

Having limited experience with diesel engines when he started college, Alex received hands-on experience and real world classes that helped prepare him for his career. During his time at NDSCS, Alex worked at RDO while he was sponsored. "For me it was great because I had a manager that allowed me to come to work on the weekends or during school breaks which gave me more experience. He also made sure to give me challenging jobs to constantly push me to be better. I have a lot of other technicians in the shop to thank for helping form me into the technician I am today."

Alex's advice for students considering a sponsorship program in the diesel technology field, "It's such a great opportunity that sets you up for success. Pay attention to your mentors and other technicians and learn from them. RDO does an excellent job of continuing your education through training."





THE SCIENCE OF SUCCESS.

North Dakota State College of Science



It is a pivotal time in the diesel industry. There is a critical shortage of skilled diesel technicians in the workforce, in addition to a weakening interest in the field—this needs to change, and we are looking to change it.

General Equipment and Supplies Inc. (GES) is a dealer of heavy construction and aggregate equipment with eight locations throughout the Midwest region. In North Dakota, there are four locations: Fargo, Minot, Bismarck, and Williston. On the heavy construction side, the product lines include Komatsu, Linkbelt Cranes, and JCB.

In 2014, GES announced the Komatsu partnership with NDSCS. The NDSCS has one of the largest diesel training facilities in the nation and partnering with them would help us adequately train and secure our future workforce. Through the NDSCS Komatsu program, GES offers 70% to 90% tuition payback based on their grades upon completion of the program. Students are guaranteed a job in North Dakota and are paid a competitive industry wage. This program is a great opportunity for students interested in the diesel field. GES personnel travel to high schools and career fairs to share information about this program. We are telling students that diesel can be an exciting career with interesting challenges, career advancements, and to have the opportunity to get their education partially paid for is an added bonus.

To have a presentation about the program or to receive more information, contact Ann Pollert at (701) 364-2181 or [annp@genequip.com](mailto:annp@genequip.com).



## 21<sup>st</sup> CCLC Afterschool Moving From STEM to STEAM

By: Joshua Sharp, 21<sup>st</sup> Century Administrator

**History:** The 21<sup>st</sup> Century Community Learning Centers (21<sup>st</sup> CCLC) afterschool programs have been offering STEM activities over the past two grant cycles which covers eight years. Some programs have been offering STEM for even longer. The 21<sup>st</sup> CCLC state guidance requires that 65% of all activities offered fall into the following categories: STEM, math, and language arts.

The 21<sup>st</sup> CCLC programs in North Dakota use multiple activities to implement STEM. The activities include offering robotics clubs, hands-on scientific experiments, and using third-party vendors to purchase STEM kits and curriculum. Each sub-grantee provides STEM training to their staff at their annual meetings. The 21<sup>st</sup> CCLC summer conference invites many STEM vendors and presenters to help 21<sup>st</sup> CCLC staff with implementing STEM in their afterschool programs.

**Future:** The NDDPI STEM programming is administered within the Division of Student Support & Innovation. The STEM initiative has since been changed to STEAM to incorporate the arts. In North Dakota, STEAM education is defined as an integrated curriculum (as opposed to science, technology, engineering, arts, and mathematics taught in isolation) that is driven by creative thinking, problem solving, discovery, exploratory project/problem-based learning, and student-centered development of ideas and solutions. Since the 21<sup>st</sup> CCLC program is also located within the Division of Student Support & Innovation, these two programs will work together in the future on STEAM projects. Some of these initiatives include collaborating with the ND STEM network and other partners to provide high quality professional development to assist our teachers, generating STEAM resources to be posted on the NDDPI website and additional collaborative projects.



**MOTT Partnership:** The 21<sup>st</sup> CCLC office is working with afterschool professionals to develop an afterschool network to provide resources and create a system of support for all afterschool programs. The Mott Foundation is dedicated to helping afterschool programs incorporate STEM into their programs. The Mott Foundation assists afterschool programs in doing this by requiring all afterschool networks to designate a STEM representative and host a STEM summit in Washington, D.C.



## Picture Writing and Image Making Workshops Provide Teachers with Tools for Increasing Literacy

In June of 2015, over 60 teachers participated in two ND Council on the Arts professional development workshops: *Picturing Writing: Fostering Literacy Through Arts*, and *Image Making within the Writing Process*. Presented by Beth Olshansky, Director of the Center for Advancement of Art-Based Literacy at University of New Hampshire, these hands-on interactive workshops provided teachers with sound, refined methods for engaging all students in integrated studies of art, writing and literature.

Based on transmediation, the act of translating meaning from one sign system to another, this research-based process uses quality picture books, simple hands-on art experience, and an on-going Artists/Writers Workshop to give children access to visual and kinesthetic, as well as verbal modes of thinking.

Picturing Writing Artists/Writers Workshop utilizes the inherent connections between visual and writing language and is designed through basic premises:

- Pictures are a natural language for thinking, developing, and expressing ideas
- Not all students work easily with words

If we are truly interested in supporting the literacy learning of all students, we would be wise to expand the range of thinking tools we provide in the classroom, **especially for our emerging or struggling readers and writers.**

Due to the success of this workshop and the feedback received from participating teachers, the North Dakota Council on the Arts, North Dakota Humanities Council, and the North Dakota Department of Public Instruction will co-sponsor to bring this powerful workshop to teachers on June 13-17, 2016. Priority will first be given to:

- Educators working in the Bureau of Indian Education schools with a high percentage of Native American Students
- Educators working in a school with a student population consisting of 40% or more at or above poverty level, and
- Educators working in a school implementing a schoolwide program.

Teachers participating in this workshop will receive five full days of hands-on training in the Picturing Writing process and an option to receive two graduate credits, four teacher manuals and one poetry resource folder, five classroom posters, seven lesson exemplars, and a classroom pack of high-quality art materials.

The workshop will be held in Bismarck at the North Dakota Heritage Center.





## Picture Writing and Image Making Workshops Provide Teachers with Tools for Increasing Literacy (continued)

### Participant Feedback:

*"This course is the BEST professional development I have ever had! I love Picturing Writing because this process gives students the opportunity to learn and participate in their learning in multi-model ways and with the learning styles that help them access the tools and strategies they need in order to thrive and succeed in all areas of their life and education! This process reaches all students and helps them succeed and love learning! Every student in North Dakota should have the right to learn with the Picture Writing process!"*

*"This class brought forth a much needed awakening in me! I am so inspired by the process!"*

*"I am going back to school with new knowledge of teaching art and writing."*

*"The impact of doing pictures before the writing is powerful. The amount of confidence that this process infuses in students is very powerful as well. I came away from the course doing things that I didn't think I could do!"*

*"Picture Writing has changed how I will approach teaching students how to write. It is a class that empowers all learners and can be easily integrated into all subject areas."*



*"Very user friendly/ready, I'll be able to confidently incorporate this into my classroom this fall."*

*"Phenomenal, life changing course! All teachers should be taught this process by Beth Olshansky!"*

*"The instructor was very knowledgeable. She modeled the Picturing Writing system and required us to create projects using the step-by-step process. It was a wonderful hands-on workshop that could be applied across many curriculum areas and used in a huge variety of ways to meet common core standards."*

## **NATURE Generates Opportunities for Students**

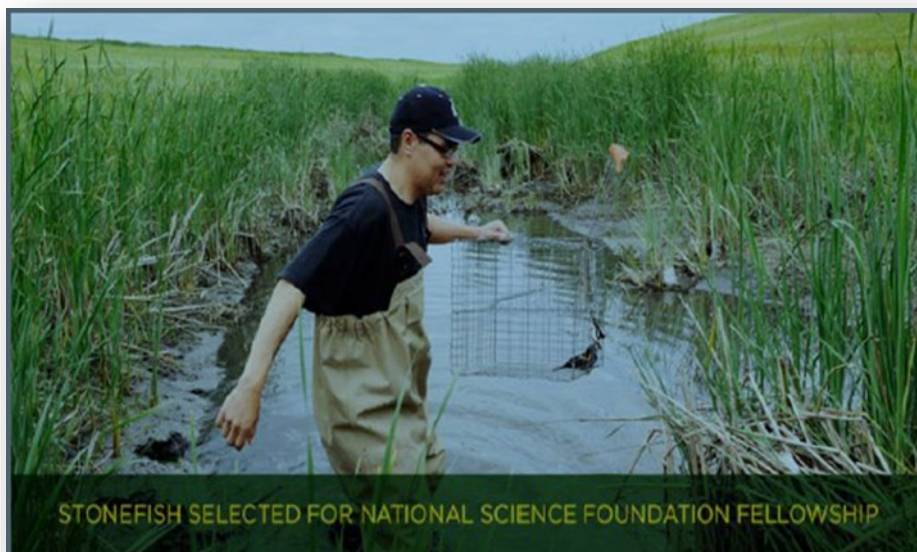
The ND EPSCoR's Nurturing American Tribal Undergraduate Research and Education (NATURE) programs help lead students to career opportunities. Developed in 1998, the NATURE program is designed to build new pathways and strengthen existing ones for American Indian students to pursue careers in science, technology, engineering and mathematics (STEM) fields. Participants of the program include students and faculty from all five tribal colleges in North Dakota, high school students and teachers from the four reservations in North Dakota, and faculty from two North Dakota research universities (see map). The three-part program includes:

University Summer Camp: This two-week summer program, hosted by NDSU and UND, introduces tribal high school and college students to STEM disciplines and career opportunities by: a) providing opportunities to experience campus life working alongside researchers, b) encouraging students to pursue four-year STEM degree programs, and c) engaging tribal high school teachers and college faculty in career improvement and lesson development.

Tribal College Summer Camp: Using programs developed at the University Summer Camp, Tribal College faculty introduce tribal high school students to STEM disciplines and career opportunities by providing opportunities to experience campus life at a Tribal College and develop a plan to transition to college level math, science, and engineering studies at these institutions.

Sunday Academy: Once a month during the academic year (September – March), high school and middle school students meet at a Tribal College and are presented with practical day-to-day problems involving math, physics, chemistry, and engineering basics in an informal and friendly atmosphere requiring them to think, analyze, and seek solutions.

As a result of the NATURE programs, participants like Dereck Stonefish, currently a graduate student in zoology at NDSU, are able to have hands-on STEM experiences. Stonefish, a graduate of Sitting Bull College, Fort Yates, is one of only four tribal college graduates in the U.S. to have received a National Science Foundation Graduate Research Fellowship since 2006 for his research on the migratory ecology of red-winged and yellow-headed blackbirds in the prairie pothole region of North Dakota.





## NATURE Generates Opportunities for Students (continued)



NATURE programs are sponsored by ND EPSCoR

For more information on how you can get involved in NATURE, visit: [www.ndepscor.nodak.edu/NATURE](http://www.ndepscor.nodak.edu/NATURE) or contact Eakalak Khan, Ph.D., P.E., ND EPSCoR NATURE Coordinator ([eakalak.khan@ndsu.edu](mailto:eakalak.khan@ndsu.edu)). North Dakota is one of 28 states and three territories currently eligible to compete in the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR). For more information on ND EPSCoR, visit: [www.ndepscor.nodak.edu](http://www.ndepscor.nodak.edu) or contact Jean Ostrom-Blonigen, Ph.D., CPA Project Administrator ([jean.ostrom-blonigen@ndsu.edu](mailto:jean.ostrom-blonigen@ndsu.edu)).







## NSELA Professional Development

# Our BIG Events in 2016!

*Leaders Serve as Change Agents in an Ever-changing Environment*

**Nashville – March 30-April 1, 2016 – Omni Hotel**

### Leadership Summit – “The Sounds of Change”

(formerly known as Professional Development Institute)

**Wednesday, March 30 – 7:30 am to 4:30 pm**

Strand A: STEM Career Readiness

Strand B: Leadership in Curriculum

◇ Project-based Learning-- Experiential Learning

◇ Implementation of Effective Instructional Practices

Strand C: Listening as a Leader – Communicating and Motivating Your Colleagues



### NSELA/CSSS Evening Reception

**Wednesday, March 30 – 6:00 pm to 8:00 pm**

### NSELA Annual Breakfast & Membership Meeting

**Thursday, March 31 – 7:30 am to 10:00 am**

### NSELA/ASTE Annual Luncheon, Keynote Speaker, & Honor Local Heroes Celebration

**Friday, April 1 – 12:00 noon to 2:00 pm**



**San Diego – June 28-July 1, 2016 – Marriott Mission Valley Hotel**

### Summer Leadership Institute – “Leadership in a Sea of Change”

Strand A: Understanding the Change Process

Strand B: Building a Culture for Change

Strand C: Making Decisions Based on Evidence



*TENTATIVE SCHEDULE: Tuesday, June 28, 1:00 pm-5:00 pm; Wednesday, June 29, 8:00 am-4:00 pm; Thursday, June 30, 8:00 am-4:00 pm; and Friday, July 1, 8:00 am-12:00 noon.*

**Stay tuned for more information**

**[www.NSELA.org](http://www.NSELA.org)**



# MSP Reminders

## **Closing Out 2014-2015 Grants**

Current sub-grantees must close out their current grant before they are eligible to receive a new grant award for the 2015-2016 school year.

To close out the grant, sub-grantees must submit the following items:

- Final Spreadsheet: Due October 19, 2015
- Mid Year/Final Financial Report (SFN 7822): Due October 19, 2015
- Final Request for Funds (SFN 14660): Due October 19, 2015
- All materials created through the grant: unit plans, lesson plans, activities

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